

#### Abstract of the Disclosure

A reactor system for producing hydrogen from a hydrocarbon or hydrocarbon derivative using autothermal reformation includes a mixture formation chamber, an autothermal reactor, and a temperature-regulated start-up burner. The start-up burner combusts the hydrocarbon or the hydrocarbon derivative with air so as to heat the mixture formation chamber and/or the autothermal reactor to a respective operating temperature. An air supply is metered to the start-up burner so as to regulate the temperature of hot gas coming out of the start-up burner to a value near or below a deterioration temperature of the catalyst material, before the hot gas contacts the mixture formation chamber and/or the autothermal reactor.